FERMILAB-LU-195

Local Station Control System Documentation

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The Local Control Stations in the Fermilab Linac Upgrade are 15–20 front ends on a token ring network that is bridged to a large collection of accelerator console Vaxes, workstations and Macintoshes. Any host that supports the relevant network protocols can access these stations. Server support allows a host to access data from an arbitrary set of these stations through a single node, in order to reduce the level of network activity as seen by the host. All stations are operated synchronously by an interrupt signal that is derived from the accelerator clock system. Each station reads several hundred analog channels and a similar number of digital bits at 15 Hz, the Linac repetition pulse rate. Every selected channel and bit is checked for alarms after every pulse, in order to allow failed devices to beable to inhibit Linac beam on the next 15 Hz cycle. Data requests are supported as either single replies or periodic replies at sub-multiples of the Linac pulse rate.

Documentation of the Local Control Station System has evolved over many years. It is organized as a fairly large set of documents produced on a Macintosh using both WriteNow and MacDraw.

The documentation consists of two parts. The first part is the original basic documentation set that was written before May 1990. It is organized into groups of related documents. Each document addresses a particular feature of the local station system and explains how it works. The second part is a supplementary documentation set that has been written since May 1990. It is organized in reverse chronological order. In a few cases, documents in the supplementary set supercede those in the original set. As new features are added to the system, additional documentation is written.

The local station software itself is developed and maintained using the MPW (Macintosh Programmer's Workshop) development environment. The MPW package is available from Apple Computer for about $525, including assembler, linker, shell, Pascal and C compilers, and a complete set of documentation. It is currently based on a Macintosh IIci. The linked executable code is converted into Motorola S-records and downloaded to a local station system via the serial port at 19.2k baud. The process of linking a new system version and downloading it currently takes about 5 minutes. Some plans are underway to eliminate this serial transfer and download the executable code directly via the network, in order to speed up the process.

VME Local Station Documentation
Application page documents
- Local Station Applications—catalogue 4/12/89
- Auto-page on Demand 7/6/89

Application Programs in VME System 6/19/87
- Analog Descriptor Page 9/25/89
- Binary Descriptor Page 10/12/89
- CRT Image Page 12/28/89
- D0 Data Requests Test Page 2/16/90
- D0 Data Settings Test Page 2/23/90
- Download Page 10/12/89
- Memory Dump Page 8/9/89
- Network Layer—Ping pong 8/2/89
- Parameter Page 9/19/89
- Entering New Parameters 3/16/89
- Request-reply Page 12/21/89
- RET/SETDAT Test Page 3/22/90
- Serial Server 10/17/89
- Station Survey Page 12/28/89
- Token Ring Page 12/20/89
- 1553 Test Page 10/16/89

Network documents
- Network Layer Routines 8/3/89
- Network Services 6/5/89
- Token Ring Chipset Timing 8/29/89

Classic protocol documents
- Data Request Block Layout—Local/data server requests 10/10/89
- Data Request Block Layout—Ordinary network requests 1/5/90
- Multiple Settings 4/13/89

D0 protocol documents
- D0 Data Requests/Settings 2/23/90
- D0 Alarms 2/5/90
- Message Format Block—Looping construct 5/17/88

Accelerator protocol documents
- Acnet Data Requests/Settings 3/16/90
- Acnet Property Data Formats for Linac 3/8/90

Memory layout documents
- VME System Lo Memory 9/22/88
- D0 Network Data Request Memory Block Layout 2/6/90
- D0 Network Data Reply Memory Block Layout 2/6/90
- Co-processor Table Format 9/15/88

These documents are more recent than those of the first published notebook. The most recent documents are listed first.

Preaccelerator HV Auto-Reset 2/18/93
Monitoring Counters 2/18/93
Acnet on UDP/IP 1/23/93
Alarms "tries needed" Upgrade 1/7/93
Name Table 9/9/92
Ping Client Test 8/9/92
Classic Protocol Message Formats 8/7/92
Database Test Page 8/4/92
IPARP Table 8/4/92
IP Security 7/1/92
IP Support 6/29/92
UDP Layer 6/29/92
IP Fragmentation 6/26/92
Network Frames Page 3/24/92
Page G Plan 3/10/92
Family Alarm Messages 3/7/92
ACNAUX Functions 3/6/92
Analog Descriptor Page 2/25/92
AcReq error codes 2/19/92
NTF Interlocks Checking 2/15/92
Vax Parameter Page Knob Control 2/5/92
Alarm Changes 1/26/92
MPW Conversion 1/13/92
Local Station Additions for Acnet 12/26/91
Memory Data Streams 12/22/91
NTF Connection 12/20/91
HUMBUG for Local Stations 12/15/91
Local Application Parameters 12/12/91
Composite Digital Status Words 11/13/91
Memory Dump Page 11/13/91
Memory-mapped I/O for D0 11/12/91
FTPMAN Timestamps 11/11/91
EACNET Support for Local Stations 11/9/91
FTPMAN Design for Local Stations 10/24/91
Accelerator Protocol Alarm Handling 9/23/91
Readings Averaging 9/15/91
Accelerator Protocol Data Server 8/4/91
SRM Message Protocols 7/23/91

SRM/Arcnet Variables Prose 6/12/91
Arcnet Support 6/10/91
Arcnet Variables 6/10/91
Acnet Generic Devices 5/9/91
Local Station Non-volatile Memory Layout 3/29/91
Local Station Prom Layout 3/29/91
Network Group Addressing 3/8/91
Data Request Timing 3/5/91
Arcnet Gateway 2/26/91
De-multiplexing D0 Data 11/1/90
System Tables (memory layout) 10/27/90
Binary Tables—3K Bits 10/27/90
Read-type Routines 10/12/90
ReqD Notes 10/2/90
System Tables (detail) 9/28/90
Simple Protocol for SRMs 9/26/90
Network Frames Page 9/20/90
Downloading Programs 8/28/90
Download Page Interface 8/28/90
Local Applications Table 8/28/90
On-board RAM 8/5/90
Motor Control Specification 7/14/90
Multiple Networks 4/23/90
Network Addressing Notes 4/2/90